

- 1 **1.** (originally presented) A database management system having the improvement comprising:
2 bitmap values, a bitmap value having a representation of a bitstring wherein set bits
3 specify a set of objects whose definitions are built into the database management system, and
4 user-accessible operations on the bitmap values.
- 1 **2.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 a set-to-bitmap operation wherein a bitmap value is derived from a given set of the
4 objects.
- 1 **3.** (originally presented) The database management system set forth in claim 2 wherein:
2 the derived bitmap value is a new bitmap value that specifies the objects in the given
3 set.
- 1 **4.** (originally presented) The database management system set forth in claim 2 wherein:
2 the derived bitmap value is a preexisting bitmap value which now further specifies the
3 objects in the given set.
- 1 **5.** (originally presented) The database management system set forth in claim 2 wherein:
2 the derived bitmap value is a preexisting bitmap value which now no longer
3 specifies any objects in the given set.
- 1 **6.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 a bitmap-to-set operation wherein the set of the objects specified in a given bitmap
4 value is derived from the given bitmap value.
- 1 **7.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 a bitmap-to-count operation wherein the number of the objects in the set specified in a
4 given bitmap value is derived from the given bitmap value.

1 **8.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 an existence operation wherein a value representing the logical value TRUE is returned
4 when a given object belongs to the set of the objects represented by a given bitmap value.

1 **9.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 a logical operation on a first bitstring represented by a first bitmap value and a second
4 bitstring represented by a second bitmap value.

1 **10.** (originally presented) The database management system set forth in claim 1 wherein the
2 user-accessible operations comprise at least:
3 a comparison operation on a first bitmap value and a second bitmap value wherein a
4 value representing the logical value TRUE is returned when the first bitmap value and the
5 second bitmap value specify the same set of the objects.

1 **11.** (originally presented) The database management system set forth in claim 1 wherein:
2 the bitmap values include settable bitmap values; and
3 the user-accessible operations comprise at least an assignment operation which sets a
4 target settable bitmap value from a source bitmap value.

1 **12.** (originally presented) The database management system set forth in claim 1 wherein:
2 the bitmap values include bitmap values that are persistent in the database management
3 system.

1 **13.** (originally presented) The database management system set forth in claim 12 wherein:
2 the persistent bitmap values include bitmap values in fields of tables of the database
3 management system.

1 **14.** (originally presented) The database management system set forth in claim 1 wherein:
2 the bitstring is compressed.

1 **15.** (originally presented) The database management system set forth in claim 1 wherein:
2 the objects are identifiers for other objects that exist in the database management
3 system.

1 **16.** (originally presented) The database management system set forth in claim 15 wherein:
2 the identifiers for the other objects are row identifiers of rows in the database
3 management system.

1 **17.** (originally presented) The database management system set forth in claim 16 wherein:
2 the row identifiers are row identifiers returned by a user-defined query executed in the
3 database management system.

1 **18.** (originally presented) The database management system set forth in claim 17 wherein:
2 the query returns a row identifier when a field in the row has an attribute specified in
3 the query,
4 whereby the bitmap value represents the set of fields having the specified attribute.

1 **19.** (originally presented) The database management system set forth in claim 1 wherein:
2 the objects are identifiers for other objects that exist outside the database management
3 system.

1 **20.** (originally presented) The database management system set forth in claim 19 wherein:
2 the identifiers for objects that exist outside the database management system are
3 electronic product codes for product items.

1 **21.** (originally presented) A data storage device, the data storage device being characterized in
2 that:
3 the data storage device contains code which, when executed in a computer system,
4 implements the database management system set forth in claim 1.

1 **22.** (originally presented) A bitmap value employed in a database management system, the
2 bitmap value representing a first set of first objects, the first objects being external to the

3 database management system and members of the first set being mapped onto a members of a
4 second set of second objects that is defined in the database management system, and
5 the bitmap value comprising:

6 a mapping specifier that maps a string of bits to a subset of the second set; and
7 a representation of the string of bits wherein a bit is set in the represented string of bits
8 when the member of the second set that is mapped to the bit has a member of the first set
9 mapped thereto.

1 **23.** (originally presented) The bitmap value set forth in claim 22 wherein:
2 the second set is ordered.

1 **24.** (originally presented) The bitmap value set forth in claim 23 wherein:
2 the order of the members of the second ordered set corresponds to values of the
3 members thereof;
4 the mapping specifier specifies the mapping by specifying one or more ranges of the
5 values of the members of the second ordered set to which the string of bits is mapped; and
6 the representation of the string of bits represents strings of bits corresponding to the
7 ranges.

1 **25.** (originally presented) The bitmap value set forth in claim 24 wherein:
2 the mapping specifier specifies the range of the values by specifying a start value and
3 an end value.

1 **26.** (originally presented) The bitmap value set forth in claim 24 wherein:
2 the values include a prefix which determines a range of the values; and
3 the mapping specifier specifies the range of the values by specifying the prefix for the
4 range.

1 **27.** (originally presented) The bitmap value set forth in claim 26 wherein:
2 the mapping specifier further specifies the range of the values by using a start value and
3 an end value to specify one or more subranges of the range specified by the prefix.

- 1 **28.** (originally presented) The bitmap value set forth in claim 24 wherein:
2 the objects in the second ordered set are identifiers for objects in the first set.
- 1 **29.** (originally presented) The bitmap value set forth in claim 28 wherein:
2 the identifiers for objects in the first set are electronic product codes for the objects
- 1 **30.** (originally presented) The bitmap value set forth in claim 22 wherein:
2 there is a plurality of the bitmap values in the database management system; and
3 certain of the bitmap values are persistent in the database management system.
- 1 **31.** (originally presented) The bitmap values set forth in claim 30 wherein:
2 the persistent bitmap values include bitmap values in fields of tables of the database
3 management system.
- 1 **32.** (originally presented) The bitmap value set forth in claim 22 wherein:
2 the representation of the bitstring is a compressed representation thereof.
- 1 **33.** (originally presented) The bitmap value set forth in claim 22 wherein:
2 there is a plurality of the bitmap values in the database management system; and
3 the database management system provides a plurality of user-accessible operations on
4 the bitmap values.
- 1 **34.** (originally presented) The bitmap value set forth in claim 33 wherein:
2 certain of the user-accessible operations alter the range specifier and the representation
3 of the bitstring as required to map the represented string of bits to a subset of the second set
4 that is required for the operation.
- 1 **35.** (originally presented) A data storage device, the data storage device being characterized in
2 that:
3 the data storage device contains code which, when executed in a computer system,
4 implements the bitmap value set forth in claim 22.

1 **36.** (originally presented) A method employed in a database system of making a bitmap value
2 that represents a first set of objects external to the database system,
3 the method comprising the steps performed in the database system of:

4 mapping the objects onto a second ordered set of identifiers defined in the database
5 management system;

6 mapping a bitstring that is represented in the bitmap value onto a subset of the second
7 set that includes the identifiers onto which the objects have been mapped; and

8 setting the bits in the bitstring that correspond to the identifiers onto which the objects
9 have been mapped.

1 **37.** (originally presented) The method set forth in claim 36 wherein:

2 in the step of mapping the objects, the identifiers in the second set are identical with
3 identifiers that are employed externally to the database system to identify the objects.

1 **38.** (originally presented) The method set forth in claim 37 wherein:

2 in the second set, the identifiers are electronic product codes.

1 **39.** (originally presented) The method set forth in claim 36 wherein the step of mapping a
2 bitstring comprises the steps of:

3 making a range specifier that specifies a range of the ordered set of identifiers that
4 includes the identifiers into which the objects have been mapped; and

5 mapping the bits in the bitstring to the specified range.

1 **40.** (originally presented) The method set forth in claim 39 wherein the step of making a range
2 specifier includes the step of:

3 making a start value and an end value which together specify the range.

1 **41.** (originally presented) The method set forth in claim 39 wherein the step of making a range
2 specifier includes the step of

3 making a prefix value which specifies the range.

1 **42.** (originally presented) The method set forth in claim 36 further comprising the step of:

2 compressing the bitstring.

1 **43.** (originally presented) A data storage device, the data storage device being characterized in
2 that:

3 the data storage device contains code which, when executed in a computer system,
4 implements the method set forth in claim 36.

1 **44.** (originally presented) A bitmap value employed in a database management system to
2 represent a first subset of the row identifiers defined in the database management system,
3 the bitmap value comprising:

4 a mapping specifier that maps a string of bits to a second subset of the set of row
5 identifiers; and

6 a representation of the string of bits wherein a bit is set in the represented string of bits
7 when the member of the second subset that is mapped to the bit corresponds to a member of
8 the first subset; and

9 the first subset is returned by a user-defined query executed by the database
10 management system

1 **45.** (originally presented) The bitmap value set forth in claim 44 wherein:

2 the database management system dynamically alters the mapping specifier and the
3 representation of the string of bits as required to map the representation of the string of bits to a
4 second subset of the row identifiers that includes the first subset of the row identifiers.

1 **46.** (originally presented) The bitmap value set forth in claim 44 wherein:

2 the query returns a row identifier when a field in the row identified by the row identifier
3 has an attribute specified in the query,

4 whereby the bitmap value represents the set of fields whose values have the specified attribute.

1 **47.** (originally presented) A data storage device, the data storage device being characterized in
2 that:

3 the data storage device contains code which, when executed in a computer system,
4 implements the method set forth in claim 44.

1 **48. (Canceled)**

1 **49. (Canceled)**

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1 **52. (Canceled)**

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1 **56. (Canceled)**

1 **57. (Canceled)**